

User Seal Check Evaluation of N95 Filtering Facepiece Respirators: Results of a Pilot Study

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Project Goal

Provide preliminary data to better understand the benefit of the user seal check (USC) step in the N95 particulate filtering facepiece respirator (FFR) donning process.

Background

- The USC is required by the Occupational Safety and Health Administration (OSHA) to be performed each time the wearer dons the respirator to verify that an adequate seal has been achieved.
- There is little data demonstrating the value of the USC for FFRs and several published reports have indicated the need for additional research^{1,2}.

Methods

- 10 experienced human test subjects per respirator model
 - All subjects were qualified for the study by passing a standard quantitative OSHA fit test (fit factor ≥ 100).
 - Each model had a different cohort of test subjects.
 - 11 total test subjects were enrolled.
- Three NIOSH-approved N95 FFR models:
 - 3M 1860, 3M 1870, Kimberly Clark PFR95-270
- Each subject was randomly fit tested 20 times per model.
 - 10 donnings with the USC step (Fig. 1).
 - 10 donnings without the USC step.
 - The fit test was not started until the subject indicated that they felt they achieved a good fit.
- The manufacturers' USC procedures were followed.

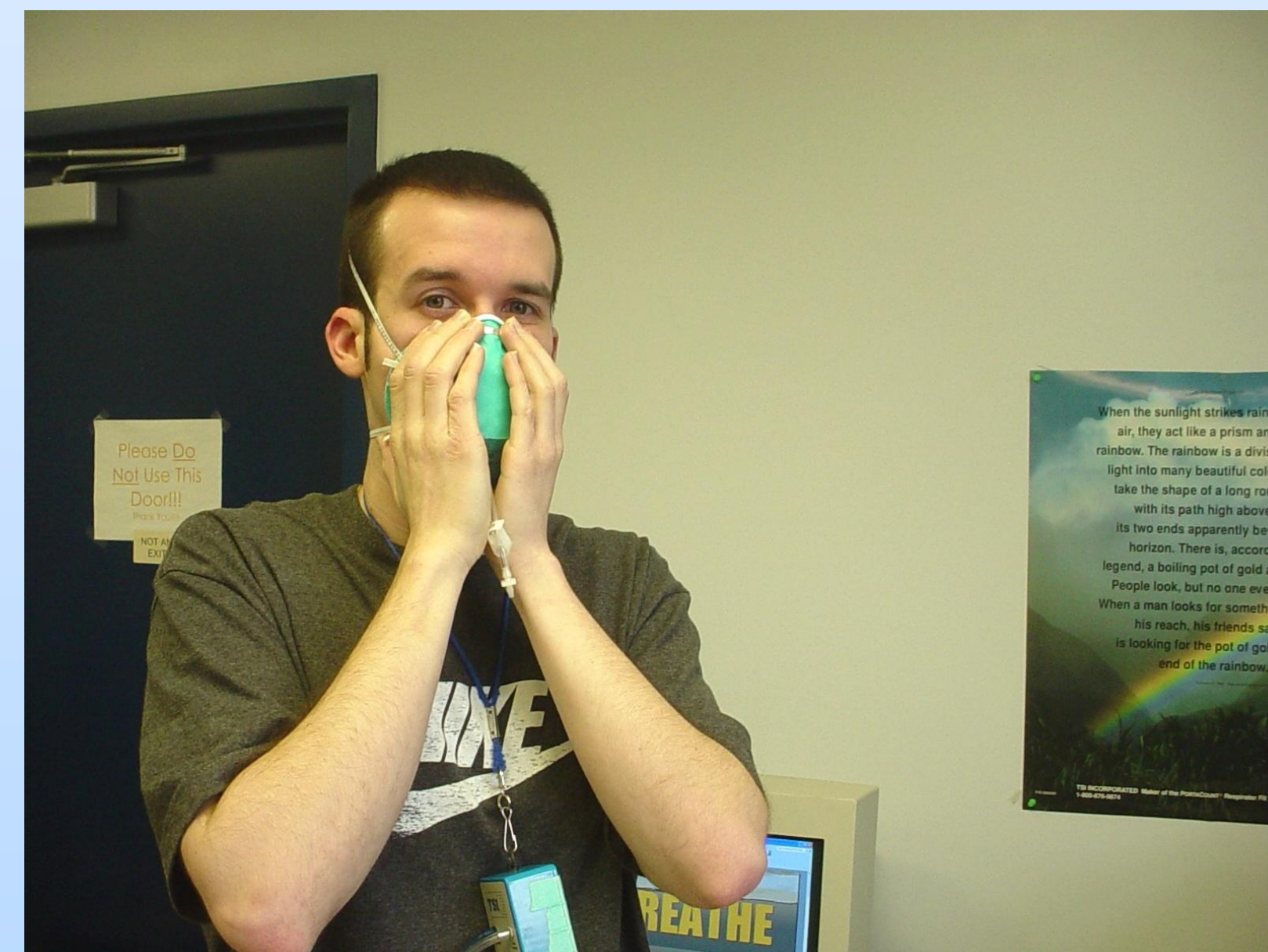


Figure 1. Test Subject Performing a User Seal Check

- A 2-minute, 6-exercise abbreviated fit test protocol was used to determine fit factors for each donning. A new FFR was used for each donning.
- Model 8020A PortaCount® Fit Tester with a model 8095 N95 Companion™ (TSI, Inc., St Paul, MN) was used for fit testing.

Results

Table 1. Mean and Standard Deviation Fit Factor Across all Models for Each Test Subject

Subject #	# Models Tested	USC Not Performed	USC Performed
0335	2	169 +/- 55	189 +/- 31
1649	2	155 +/- 54	157 +/- 50
2767	3	151 +/- 64	171 +/- 47
3108	3	185 +/- 28	192 +/- 25
3771	2	151 +/- 73	172 +/- 50
3828	3	187 +/- 35	200 +/- 0
4322	3	164 +/- 54	174 +/- 38
4615	3	170 +/- 47	164 +/- 54
7705	3	109 +/- 65	149 +/- 51
8302	3	134 +/- 63	150 +/- 62
9867	3	163 +/- 56	178 +/- 47

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Table 2. Mean and Standard Deviation Fit Factor by Respirator Model

	3M 1860	3M 1870	KC PFR95-270
USC Not Performed	142 +/- 57	191 +/- 29	141 +/- 67
USC Performed	160 +/- 51	189 +/- 33	168 +/- 50

Limitations

- Small number of test subjects (n=10 for each model) and FFR models (n=3).
- Test subjects were experienced respirator test subjects. Inexperienced subjects may have performed differently.

Preliminary Findings / Next Steps

- 10 of the 11 subjects achieved higher mean factors and had smaller standard deviation fit factors across all models tested when performing the USC compared to not performing the USC.
- Higher fit factors were obtained for the 3M 1860 and KC PFR95-270 models when the USC was performed.
- Further data analysis will be done to determine whether the trends are statistically significant.
- Future data collection should focus on assessing the “predictive” abilities of the USC step on both experienced and less experienced users.

References

- American Industrial Hygiene Association Respiratory Protection Committee. White paper ‘Research Needs in Respiratory Protection.’ November 2009. <http://www.aiha.org/newspubs/govtaffairs/Documents/Research-Resp%20Protection-11-09-09.pdf>
- Brosseau, LM. Final report. ‘Toward Better Fitting Respirators. No Fit Test Respirator Workshop and Research Roadmap.’ RFQ 2008-Q-10205. 2009. <http://www.sph.umn.edu/ce/presentations/nofit.asp>